

SPM BULLETIN

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1. EDITOR'S NOTE

A recent series of papers of Franklin Tall on selective properties (SPM), some of which announced below, is noteworthy.

Greetings to Vladimir Tkachuk for the publication of his new book, announced below.

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2. A NEW BOOK ON C_p -THEORY

Dear Colleagues: This message is to inform you that my book entitled **A C_p -theory Problem Book** has already been published in Springer. At the Springer's page

<http://www.springer.com/mathematics/geometry/book/978-1-4419-7441-9>

you can see its contents, sample pages and preface. The book has 500 problems with complete solutions and constitutes a self-contained introduction to C_p -theory and General Topology. However, it also contains research topics and deep results in general topology and C_p -theory. To mention just a few, in this book you can find:

- (1) Ten properties equivalent to paracompactness.
- (2) The Stone-Weierstrass theorem for compact spaces.
- (3) Theorems on cardinal functions in linearly ordered spaces.
- (4) Introduction to the theory of realcompact spaces and Dieudonné complete spaces.
- (5) Shapiro's deep theorem that states that every compact space of countable tightness has a point-countable π -base.
- (6) The theorem that every continuous map on a product of second countable spaces depends on countably many coordinates.
- (7) Arhangel'skii's theorem on cardinality of first countable compact spaces.
- (8) Arhangel'skii's theorem on tightness and free sequences in compact spaces.
- (9) The theorem states that every dyadic compact space of countable tightness is metrizable.
- (10) Shakhmatov's example of an infinite space X such that $C_p(X)$ is σ -pseudocompact.

and many other concepts, facts and theorems together with 100 open problems in C_p -theory and a bibliography of 200 items.

With best regards,

Vladimir Tkachuk

3. LONG ANNOUNCEMENTS

3.1. Elementary submodels in infinite combinatorics. We show that usage of elementary submodels is a simple but powerful method to prove theorems, or to simplify proofs in infinite combinatorics. First we introduce all the necessary concepts of logic, then we prove classical theorems using elementary submodels. We also present a new proof of Nash-Williams's theorem on cycle-decomposition of graphs, and finally we obtain some new decomposition theorems by eliminating GCH from some proofs concerning bond-faithful decompositions of graphs.

<http://arxiv.org/abs/1007.4309>

Lajos Soukup

3.2. Monotone hulls for $\mathcal{N} \cap \mathcal{M}$. Using the method of decisive creatures (see Kellner and Shelah [KrSh:872]) we show the consistency of “there is no increasing ω_2 -chain of Borel sets and $\text{non}(\mathcal{N}) = \text{non}(\mathcal{M}) = \omega_2 = 2^\omega$ ”. Hence, consistently, there are no monotone Borel hulls for the ideal $\mathcal{M} \cap \mathcal{N}$. This answers questions of Balcerzak and Filipczak. Next we use FS iteration with partial memory to show that there may be monotone Borel hulls for the ideals \mathcal{M}, \mathcal{N} even if they are not generated by towers.

<http://arxiv.org/abs/1007.5368>

Andrzej Rosłanowski and Saharon Shelah

Editor's note. Steprans and I observed long ago (answering a question A. Krawczyk asked us on our way back from the first European Set Theory conference) that in the Cohen model, there is no increasing \aleph_2 -chain of Borel sets. This can be proved in the same way as Kunen's classical (thesis) argument that there is no tower of length \aleph_2 in the Cohen model. This simple observation was not published. The above result is much stronger, of course.

3.3. Continuous maps on Aronszajn trees. Assuming Jensen's principle diamond: Whenever B is a totally imperfect set of real numbers, there is special Aronszajn tree with no continuous order preserving map into B .

<http://arxiv.org/abs/1008.4739>

Kenneth Kunen, Jean Larson, and Juris Steprāns

3.4. The Filter Dichotomy and medial limits. The *Filter Dichotomy* says that every uniform nonmeager filter on the integers is mapped by a finite-to-one function to an ultrafilter. The consistency of this principle was proved by Blass and Laflamme. A function between topological spaces is *universally measurable* if the preimage of every

open subset of the codomain is measured by every Borel measure on the domain. A *medial limit* is a universally measurable function from $\mathcal{P}(\omega)$ to the unit interval $[0, 1]$ which is finitely additive for disjoint sets, and maps singletons to 0 and ω to 1. Christensen and Mokobodzki independently showed that the Continuum Hypothesis implies the existence of medial limits. We show that the Filter Dichotomy implies that there are no medial limits.

<http://arxiv.org/abs/1009.0065>

Paul B. Larson

3.5. Bernstein sets and κ -coverings. In this paper we study a notion of a κ -covering in connection with Bernstein sets and other types of nonmeasurability. Our results correspond to those obtained by Muthuvel and Nowik. We consider also other types of coverings.

<http://arxiv.org/abs/1009.0818>

J. Kraszewski, R. Ralowski, P. Szczepaniak and S. Zeberski

3.6. Ideal games and Ramsey sets. It is shown that Matet's characterization of \mathcal{H} -Ramsey-ness relative to a selective coideal \mathcal{H} , in terms of games of Kastanas, still holds if we consider semiselectivity instead of selectivity. Moreover, we prove that a coideal \mathcal{H} is semiselective if and only if Matet's game-theoretic characterization of \mathcal{H} -Ramsey-ness holds. This gives a game-theoretic counter part to a theorem of Farah, asserting that a coideal \mathcal{H} is semiselective if and only if the family of \mathcal{H} -Ramsey subsets of $\mathbb{N}^{[\infty]}$ coincides with the family of those sets having the $\text{Exp}(\mathcal{H})$ -Baire property. Finally, we show that under suitable assumptions, semiselectivity is equivalent to the Fréchet-Urysohn property.

<http://arxiv.org/abs/1009.3683>

Carlos Di Prisco, Jose G. Mijares, Carlos Uzcategui

3.7. Nonmeasurable unions of sets and continuity of group representations. Let G be a locally compact group, and let U be its unitary representation on a Hilbert space H . Endow the space $L(H)$ of linear bounded operators on H with weak operator topology. We prove that if U is a measurable map from G to $L(H)$ then it is continuous. This result was known before for separable H . To prove this, we generalize a known theorem on nonmeasurable unions of point finite families of null sets. We prove also that the following statement is consistent with ZFC: every measurable homomorphism from a locally compact group into any topological group is continuous. This relies, in turn, on the following theorem: it is consistent with ZFC that for every null set S in a locally compact group there is a set A such that AS is non-measurable.

<http://arxiv.org/abs/1010.0999>

Julia Kuznetsova

3.8. On weakly tight families. Using ideas from Shelah's recent proof that a completely separable maximal almost disjoint family exists when $\mathfrak{c} < \aleph_\omega$, we construct a weakly tight family under the hypothesis $\mathfrak{s} \leq \mathfrak{b} < \aleph_\omega$. The case when $\mathfrak{s} < \mathfrak{b}$ is handled in ZFC and does not require $\mathfrak{b} < \aleph_\omega$, while an additional PCF type hypothesis, which holds when $\mathfrak{b} < \aleph_\omega$ is used to treat the case $\mathfrak{s} = \mathfrak{b}$. The notion of a weakly tight family is a natural weakening of the well studied notion of a Cohen indestructible maximal almost disjoint family. It was introduced by Hrušák and García Ferreira, who applied it to the Katětov order on almost disjoint families.

<http://arxiv.org/abs/1010.1226>

Dilip Raghavan and Juris Steprāns

3.9. Partitions of groups and matroids into independent subsets. Can the real line with removed zero be covered by countably many linearly (algebraically) independent subsets over the field of rationals? We use a matroid approach to show that an answer is “Yes” under the Continuum Hypothesis, and “No” under its negation.

<http://arxiv.org/abs/1010.1359>

Taras Banach, Igor Protasov

3.10. On M -separability of countable spaces and function spaces. We study M -separability as well as some other combinatorial versions of separability. In particular, we show that the set-theoretic hypothesis $\mathfrak{b} = \mathfrak{d}$ implies that the class of selectively separable spaces is not closed under finite products, even for the spaces of continuous functions with the topology of pointwise convergence. We also show that there exists no maximal M -separable countable space in the model of Frankiewicz, Shelah, and Zbierski in which all closed P -subspaces of ω^* admit an uncountable family of nonempty open mutually disjoint subsets. This answers several questions of Bella, Bonanzinga, Matveev, and Tkachuk.

<http://arxiv.org/abs/1010.2474>

Dušan Repovš and Lyubomyr Zdomskyy

3.11. Bornologies, selection principles and function spaces. We study some closure-type properties of function spaces endowed with the new topology of strong uniform convergence on a bornology introduced by Beer and Levy in 2009. The study of these function spaces was initiated elsewhere. The properties we study are related to selection principles.

<http://arxiv.org/abs/1010.3368>

Agata Caserta, Giuseppe Di Maio and Ljubisa D.R. Kocinac

3.12. Rothberger bounded groups and Ramsey theory. We show that: 1. Rothberger bounded subgroups of sigma-compact groups are characterized by Ramseyan partition relations. 2. For each uncountable cardinal κ there is a T_0 topological group of cardinality κ such that ONE has a winning strategy in the point-open game on the group and the group is not a subspace of any sigma-compact space. 3. For

each uncountable cardinal κ there is a T_0 topological group of cardinality κ such that ONE has a winning strategy in the point-open game on the group and the group is σ -compact.

<http://arxiv.org/abs/1011.1869>

Marion Scheepers

3.13. On the length of chains of proper subgroups covering a topological group. We prove that if an ultrafilter L is not coherent to a Q -point, then each analytic non- σ -bounded topological group G admits an increasing chain $\langle G_\alpha : \alpha < \mathfrak{b}(L) \rangle$ of its proper subgroups such that:

(1) $\bigcup_\alpha G_\alpha = G$; and

(2) For every σ -bounded subgroup H of G there exists α such that $H \subset G_\alpha$.

In case of the group of all permutations of ω with the topology inherited from ω^ω , this improves upon earlier results of S. Thomas.

<http://arxiv.org/abs/1011.1031>

Taras Banach, Dušan Repovš, Lyubomyr Zdomskyy

3.14. Core compactness and diagonality in spaces of open sets. We investigate when the space \mathcal{O}_X of open subsets of a topological space X endowed with the Scott topology is core compact. Such conditions turn out to be related to infra-consonance of X , which in turn is characterized in terms of coincidence of the Scott topology of $\mathcal{O}_X \times \mathcal{O}_X$ with the product of the Scott topologies of \mathcal{O}_X at (X, X) . On the other hand, we characterize diagonality of \mathcal{O}_X endowed with the Scott convergence and show that this space can be diagonal without being pretopological. New examples are provided to clarify the relationship between pretopologicity, topologicity and diagonality of this important convergence space.

<http://arxiv.org/abs/1011.3574>

Francis Jordan and Frederic Mynard

3.15. Very I-favorable spaces. We prove that a Hausdorff space X is very I-favorable if and only if X is the almost limit space of a σ -complete inverse system consisting of (not necessarily Hausdorff) second countable spaces and surjective d-open bonding maps. It is also shown that the class of Tychonoff very I-favorable spaces with respect to the co-zero sets coincides with the d-openly generated spaces.

<http://arxiv.org/abs/1011.3586>

A. Kucharski, Sz. Plewik and V. Valov

3.16. Topological classification of zero-dimensional M_ω -groups. A topological group G is called an M_ω -group if it admits a countable cover \mathcal{K} by closed metrizable subspaces of G such that a subset U of G is open in G if and only if $U \cap K$ is open in K for every $K \in \mathcal{K}$. It is shown that any two non-metrizable uncountable separable zero-dimensional M_ω -groups are homeomorphic. Together with Zelenyuk's classification of countable k_ω -groups this implies that the topology of a non-metrizable

zero-dimensional M_ω -group G is completely determined by its density and the compact scatteredness rank $r(G)$ which, by definition, is equal to the least upper bound of scatteredness indices of scattered compact subspaces of G .

<http://arxiv.org/abs/1011.4555>

Taras Banakh

3.17. On the Menger covering property and D -spaces. The main results of this note are: It is consistent that every subparacompact space X of size ω_1 is a D -space; If there exists a Michael space, then all productively Lindelöf spaces have the Menger property, and, therefore, are D -spaces; and Every locally D -space which admits a σ -locally finite cover by Lindelöf spaces is a D -space.

<http://arxiv.org/abs/1012.1094>

Dušan Repovš and Lyubomyr Zdomskyy

3.18. On meager function spaces, network character and meager convergence in topological spaces. For a non-isolated point x of a topological space X the network character $nw_\chi(x)$ is the smallest cardinality of a family of infinite subsets of X such that each neighborhood $O(x)$ of x contains a set from the family. We prove that (1) each paracompact space X admitting a closed map onto a non-discrete Frechet-Urysohn space contains a non-isolated point x with countable network character; (2) for each point $x \in X$ with countable character there is an injective sequence in X that \mathcal{F} -converges to x for some meager filter \mathcal{F} on ω ; (3) if a functionally Hausdorff space X contains an \mathcal{F} -convergent injective sequence for some meager filter \mathcal{F} , then for every T_1 -space Y that contains two non-empty open sets with disjoint closures, the function space $C_p(X, Y)$ is meager.

<http://arxiv.org/abs/1012.2522>

Taras Banakh, Volodymyr Mykhaylyuk, Lyubomyr Zdomskyy

3.19. Independently axiomatizable $L_{\omega_1, \omega}$ theories. In partial answer to a question posed by Arnie Miller (<http://www.math.wisc.edu/~miller/res/problem.pdf>) and X. Caicedo, we obtain sufficient conditions for an $L_{\omega_1, \omega}$ theory to have an independent axiomatization. As a consequence we obtain two corollaries: The first, assuming Vaught's Conjecture, every $L_{\omega_1, \omega}$ theory in a countable language has an independent axiomatization.

The second, this time outright in ZFC, every intersection of a family of Borel sets can be formed as the intersection of a family of independent Borel sets.

J. Symbolic Logic **74** (2009), 1273-1286.

<http://arxiv.org/abs/1012.3422>

Greg Hjorth, Ioannis Soukotas

3.20. Order-theoretic properties of bases in topological spaces, I. We study some cardinal invariants of an order-theoretic fashion on products and box products of topological spaces. In particular, we concentrate on the Noetherian type (Nt),

defined by Peregudov in the 1990s. Some highlights of our results include: 1) There are spaces X and Y such that $Nt(X \times Y) < \min\{Nt(X), Nt(Y)\}$. 2) In several classes of compact spaces, the Noetherian type is preserved by their square and their dense subspaces. 3) The Noetherian type of some countably supported box products cannot be determined in ZFC. In particular, it is sensitive to square principles and some Chang Conjecture variants. 4) PCF theory can be used to provide ZFC upper bounds to Noetherian type on countably supported box products. The underlying combinatorial notion is a weakening of Shelah's freeness.

<http://arxiv.org/abs/1012.3966>

Menachem Kojman, David Milovich and Santi Spadaro

3.21. Quasi-selective and weakly Ramsey ultrafilters. Selective ultrafilters are characterized by many equivalent properties, in particular the Ramsey property that every finite coloring of unordered pairs of integers has a homogeneous set in \mathcal{U} , and the equivalent property that every function is nondecreasing on some set in \mathcal{U} . Natural weakenings of these properties led to the inequivalent notions of weakly Ramsey and of quasi-selective ultrafilter, introduced and studied in earlier works. \mathcal{U} is weakly Ramsey if for every finite coloring of unordered pairs of integers there is a set in \mathcal{U} whose pairs share only two colors, while \mathcal{U} is f -quasi-selective if every function $g < f$ is nondecreasing on some set in \mathcal{U} . In this paper we consider the relations between various natural cuts of the ultrapowers of \mathbb{N} modulo weakly Ramsey and f -quasi-selective ultrafilters. In particular we characterize those weakly Ramsey ultrafilters that are isomorphic to a quasi-selective ultrafilter.

<http://arxiv.org/abs/1012.4338>

Marco Forti

3.22. Topologies on groups determined by sets of convergent sequences. A Hausdorff topological group (G, τ) is called a s -group and τ is called a s -topology if there is a set S of sequences in G such that τ is the finest Hausdorff group topology on G in which every sequence of S converges to the unit. The class \mathbf{S} of all s -groups contains all sequential Hausdorff groups and it is finitely multiplicative. A quotient group of a s -group is a s -group. For non-discrete (Abelian) topological group (G, τ) the following three assertions are equivalent: 1) (G, τ) is a s -group, 2) (G, τ) is a quotient group of a Graev-free (Abelian) topological group over a Fréchet-Urysohn Tychonoff space, 3) (G, τ) is a quotient group of a Graev-free (Abelian) topological group over a sequential Tychonoff space.

<http://arxiv.org/abs/1101.2754>

S. Gabrielyan

3.23. Variations of selective separability II: discrete sets and the influence of convergence and maximality. A space X is called selectively separable (R-separable) if for every sequence of dense subspaces $(D_n : n \in \omega)$ one can pick finite (respectively, one-point) subsets $F_n \subset D_n$ such that $\bigcup_{n \in \omega} F_n$ is dense in X . These

properties are much stronger than separability, but are equivalent to it in the presence of certain convergence properties. For example, we show that every Hausdorff separable radial space is R-separable and note that neither separable sequential nor separable Whyburn spaces have to be selectively separable. A space is called *d-separable* if it has a dense σ -discrete subspace. We call a space X D-separable if for every sequence of dense subspaces $(D_n : n \in \omega)$ one can pick discrete subsets $F_n \subset D_n$ such that $\bigcup_{n \in \omega} F_n$ is dense in X . Although *d*-separable spaces are often also *D*-separable (this is the case, for example, with linearly ordered *d*-separable or stratifiable spaces), we offer three examples of countable non-*D*-separable spaces. It is known that *d*-separability is preserved by arbitrary products, and that for every X , the power $X^{d(X)}$ is *d*-separable. We show that D-separability is not preserved even by finite products, and that for every infinite X , the power $X^{2^{d(X)}}$ is not D-separable. However, for every X there is a Y such that $X \times Y$ is D-separable. Finally, we discuss selective and D-separability in the presence of maximality. For example, we show that (assuming $\mathfrak{d} = \mathfrak{c}$) there exists a maximal regular countable selectively separable space, and that (in ZFC) every maximal countable space is D-separable (while some of those are not selectively separable). However, no maximal space satisfies the natural game-theoretic strengthening of D-separability.

<http://arxiv.org/abs/1101.4615>

Angelo Bella, Mikhail Matveev, Santi Spadaro

3.24. Star-covering properties: generalized Ψ -spaces, countability conditions, reflection. We investigate star-covering properties of Ψ -like spaces. We show star-Lindelöfness is reflected by open perfect mappings. In addition, we offer a new equivalence of CH.

<http://arxiv.org/abs/1103.5716>

L. P. Aiken

3.25. On productively Lindelöf spaces. The class of spaces such that their product with every Lindelöf space is Lindelöf is not well-understood. We prove a number of new results concerning such productively Lindelöf spaces with some extra property, mainly assuming the Continuum Hypothesis.

<http://arxiv.org/abs/1104.1759>

Franklin D. Tall, Boaz Tsaban

3.26. Productively Lindelöf spaces may all be D. We give easy proofs that a) the Continuum Hypothesis implies that if the product of X with every Lindelöf space is Lindelöf, then X is a D-space, and b) Borel's Conjecture implies every Rothberger space is Hurewicz.

<http://arxiv.org/abs/1104.2794>

Franklin D. Tall

Remark. Reader's puzzled by (b) of the last announcement should notice that it deals with *arbitrary*, not necessarily metrizable, topological spaces.

3.27. Lindelöf spaces which are indestructible, productive, or D.

<http://arxiv.org/abs/1104.2793>

Franklin D. Tall, Leandro F. Aurichi We discuss relationships in Lindelöf spaces among the properties “indestructible”, “productive”, “D”, and related properties.

3.28. Set-theoretic problems concerning Lindelöf spaces. I survey problems concerning Lindelöf spaces which have partial set-theoretic solutions.

<http://arxiv.org/abs/1104.2796>

Franklin D. Tall

4. SHORT ANNOUNCEMENTS

4.1. The strong splitting number.

<http://arxiv.org/abs/1007.2266>

Shimon Garti and Saharon Shelah

4.2. On strongly summable ultrafilters.

<http://arxiv.org/abs/1006.3816>

Peter Krautzberger

4.3. Guessing clubs for \mathfrak{aD} , non D-spaces.

<http://arxiv.org/abs/1007.1666>

Daniel Soukup

4.4. Polish topometric groups.

<http://arxiv.org/abs/1007.3367>

Itai Ben Yaacov, Alexander Berenstein, Julien Melleray

4.5. Large weight does not yield an irreducible base.

<http://arxiv.org/abs/1007.2693>

Saharon Shelah

4.6. All automorphisms of all Calkin algebras.

<http://arxiv.org/abs/1007.4034>

Ilijas Farah

4.7. Forcing \square_{ω_1} with finite conditions.

<http://arxiv.org/abs/1010.0327>

Gregor K. Dolinar and Mirna Džamonja

4.8. A decomposition theorem for compact groups with application to supercompactness.

<http://arxiv.org/abs/1010.3329>

Wiesław Kubiś, Sławomir Turek

- 4.9. Productivity of sequences with respect to a given weight function.
<http://arxiv.org/abs/1011.1524>
Dikran Dikranjan, Dmitri Shakhmatov, Jan Spěvák
- 4.10. Dual topologies on non-abelian groups.
<http://arxiv.org/abs/1011.3530>
María V. Ferrer, Salvador Hernández
- 4.11. Quasi-selective ultrafilters and asymptotic numerosities.
<http://arxiv.org/abs/1011.2089>
Mauro Di Nasso and Marco Forti
- 4.12. Topologies on groups determined by sequences: Answers to several questions of I.Protasov and E.Zelenyuk.
<http://arxiv.org/abs/1011.4554>
Taras Banakh
- 4.13. A direct proof of the five element basis theorem.
<http://arxiv.org/abs/1012.0596>
Boban Velickovic, Giorgio Venturi
- 4.14. The combinatorial essence of supercompactness.
<http://arxiv.org/abs/1012.2040>
Christoph Weiß
- 4.15. On the consistency strength of the proper forcing axiom.
<http://arxiv.org/abs/1012.2046>
Matteo Viale, Christoph Weiß
- 4.16. A Kronecker-Weyl theorem for subsets of abelian groups.
<http://arxiv.org/abs/1012.4177>
Dmitri Shakhmatov, Dikran Dikranjan
- 4.17. Finite basis for analytic strong n -gaps.
<http://arxiv.org/abs/1012.4954>
Antonio Avilés, Stevo Todorčević
- 4.18. Pontryagin duality for Abelian s - and sb -groups.
<http://arxiv.org/abs/1101.2756>
S. Gabrielyan
- 4.19. Pontryagin duality in the class of precompact Abelian groups and the Baire property.
<http://arxiv.org/abs/1101.4504>
Montserrat Bruguera and Mikhail Tkachenko

4.20. Metrization criteria for compact groups in terms of their dense subgroups.

<http://arxiv.org/abs/1102.5077>

Dikran Dikranjan, Dmitri Shakhmatov

4.21. PFA(S)[S] and the Arhangel'skii-Tall problem.

<http://arxiv.org/abs/1104.2795>

Franklin D. Tall

5. UNSOLVED PROBLEMS FROM EARLIER ISSUES

Issue 1. Is $\left(\frac{\Omega}{\Gamma}\right) = \left(\frac{\Omega}{\Gamma}\right)$?

Issue 2. Is $U_{\text{fin}}(\mathcal{O}, \Omega) = S_{\text{fin}}(\Gamma, \Omega)$? And if not, does $U_{\text{fin}}(\mathcal{O}, \Gamma)$ imply $S_{\text{fin}}(\Gamma, \Omega)$?

Issue 4. Does $S_1(\Omega, \Gamma)$ imply $U_{\text{fin}}(\Gamma, \Gamma)$?

Issue 5. Is $\mathfrak{p} = \mathfrak{p}^*$? (See the definition of \mathfrak{p}^* in that issue.)

Issue 6. Does there exist (in ZFC) an uncountable set satisfying $S_{\text{fin}}(\mathcal{B}, \mathcal{B})$?

Issue 8. Does $X \notin \text{NON}(\mathcal{M})$ and $Y \notin \text{D}$ imply that $X \cup Y \notin \text{COF}(\mathcal{M})$?

Issue 9 (CH). Is $\text{Split}(\Lambda, \Lambda)$ preserved under finite unions?

Issue 10. Is $\text{cov}(\mathcal{M}) = \mathfrak{od}$? (See the definition of \mathfrak{od} in that issue.)

Issue 12. Could there be a Baire metric space M of weight \aleph_1 and a partition \mathcal{U} of M into \aleph_1 meager sets where for each $\mathcal{U}' \subset \mathcal{U}$, $\bigcup \mathcal{U}'$ has the Baire property in M ?

Issue 14. Does there exist (in ZFC) a set of reals X of cardinality \mathfrak{d} such that all finite powers of X have Menger's property $S_{\text{fin}}(\mathcal{O}, \mathcal{O})$?

Issue 15. Can a Borel non- σ -compact group be generated by a Hurewicz subspace?

Issue 16 (MA). Is there $X \subseteq \mathbb{R}$ of cardinality continuum, satisfying $S_1(\mathcal{B}_\Omega, \mathcal{B}_\Gamma)$?

Issue 17 (CH). Is there a totally imperfect X satisfying $U_{\text{fin}}(\mathcal{O}, \Gamma)$ that can be mapped continuously onto $\{0, 1\}^{\mathbb{N}}$?

Issue 18 (CH). Is there a Hurewicz X such that X^2 is Menger but not Hurewicz?

Issue 19. Does the Pytkeev property of $C_p(X)$ imply that X has Menger's property?

Issue 20. Does every hereditarily Hurewicz space satisfy $S_1(\mathcal{B}_\Gamma, \mathcal{B}_\Gamma)$?

Issue 21 (CH). Is there a Rothberger-bounded $G \leq \mathbb{Z}^{\mathbb{N}}$ such that G^2 is not Menger-bounded?

Issue 22. Let \mathcal{W} be the van der Waerden ideal. Are \mathcal{W} -ultrafilters closed under products?

Issue 23. Is the δ -property equivalent to the γ -property $\left(\frac{\Omega}{\Gamma}\right)$?

Previous issues. The previous issues of this bulletin are available online at <http://front.math.ucdavis.edu/search?&t=%22SPM+Bulletin%22>

Contributions. Announcements, discussions, and open problems should be emailed to tsaban@math.biu.ac.il

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